

AMENDMENTS TO THE CLAIMS

Claims 1-25 (Canceled)

Claim 26 (New) A polishing state monitoring apparatus comprising:

- a light source;
- a light-emitting unit disposed in a polishing table having a polishing surface, for applying light from said light source to a surface, being polished, of a workpiece;
- a light-receiving unit disposed in said polishing table, for receiving reflected light from said surface of said workpiece;
- a spectroscopy unit for dividing the reflected light received by said light-receiving unit into a plurality of light rays having respective wavelengths;
- light-receiving elements for detecting the light rays divided by said spectroscopy unit, and accumulating the detected light rays as electrical information;
- a spectral data generator for reading the electrical information accumulated by said light-receiving elements and generating spectral data of the reflected light;
- a control unit for controlling said light-receiving elements to perform a sampling process at a predetermined timing in synchronism with rotation of said polishing table; and
- a processor for calculating a predetermined characteristic value on said surface of said workpiece based on the spectral data generated by said spectral data generator.

Claim 27 (New) A polishing state monitoring apparatus according to claim 26, wherein said control unit controls the timing of the sampling process performed by said light-receiving elements so that a sampling point is located on a line interconnecting the center of said polishing table and the center of said workpiece.

Claim 28 (New) A polishing state monitoring apparatus according to claim 27, wherein said light-emitting unit and said light-receiving unit pass across the center of said workpiece.

Claim 29 (New) A polishing state monitoring apparatus according to claim 26, wherein said control unit is capable of adjusting the sampling period of the sampling process performed by said light-receiving elements based on a rotational speed of said polishing table.

Claim 30 (New) A polishing state monitoring apparatus comprising:

a light source;

a light-emitting unit disposed in a polishing table having a polishing surface, for applying light from said light source to a surface, being polished, of a workpiece;

a light-receiving unit disposed in said polishing table, for receiving reflected light from said surface of said workpiece;

a spectroscopy unit for dividing the reflected light received by said light-receiving unit into a plurality of light rays having respective wavelengths;

light-receiving elements for detecting the light rays divided by said spectroscopy unit, and accumulating the detected light rays;

a spectral data generator for reading the information accumulated by said light-receiving elements and generating spectral data of the reflected light;

a control unit for controlling said light-receiving elements to perform a sampling process at a predetermined timing in synchronism with rotation of said polishing table; and

a processor for calculating a predetermined characteristic value on said surface of said workpiece according to a calculation including a multiplication which multiplies wavelength components of the spectral data generated by said spectral data generator by a predetermined set of weighting coefficients.

Claim 31 (New) A polishing state monitoring apparatus according to claim 30, wherein said characteristic value comprises a chromaticity coordinate value converted from said spectral data.

Claim 32 (New) A polishing state monitoring apparatus according to claim 26, wherein said light source emits light having a wavelength band.

Claim 33 (New) A polishing state monitoring apparatus according to claim 26, wherein said light source comprises a pulsed light source.

Claim 34 (New) A polishing state monitoring apparatus according to claim 26, wherein said light source comprises a continuous light source which is continuously turned on at least while said light-receiving elements are detecting the reflected light from said surface of said workpiece.

Claim 35 (New) A polishing apparatus comprising:
a top ring for holding a workpiece;
a polishing table having a polishing surface which is brought in sliding contact with said workpiece;
a polishing state monitoring apparatus according to claim 26; and
a light transmission unit mounted on said polishing table for transmitting therethrough the light applied from said light-emitting unit of said polishing state monitoring apparatus and the reflected light from said surface of said workpiece.

Claim 36 (New) A method of polishing a film formed on a workpiece, comprising:
applying light from a light source to a surface, being polished, of a workpiece;
detecting reflected light from said surface of said workpiece;
dividing the detected light and generating spectral data thereof;
calculating a characteristic value of said surface of said workpiece according to a calculation including a multiplication which multiplies said spectral data by a weight function; and
monitoring the progress of polishing of said surface of said workpiece using said characteristic value.

Claim 37 (New) A method according to claim 36, wherein a characteristic point of time variation of said characteristic value is detected, and a polishing process is stopped or a polishing

condition is changed when a predetermined time has elapsed after detection of the characteristic point.

Claim 38 (New) A method according to claim 36, wherein said weight function is adjusted using the time variation of said characteristic value.

Claim 39 (New) A method according to claim 38, wherein said weight function is adjusted by moving said weight function along a wavelength axis.

Claim 40 (New) A method according to of claim 36, wherein said film comprises a metal film.

Claim 41 (New) A method according to claim 36, wherein said film comprises an oxide film.

Claim 42 (New) A method according to claim 52, further comprising:
multiplying said spectral data by a desired second weight function different from said weight function and integrating the product to generate a second scalar value;
calculating a second characteristic value of said surface of said workpiece using said second scalar value; and
monitoring the progress of polishing of said surface of said workpiece using said characteristic value and said second characteristic value.

Claim 43 (New) An apparatus for polishing a film formed on a workpiece, comprising:
a light source for applying light to a surface, being polished, of a workpiece;
a light-receiving unit for receiving reflected light from said surface of said workpiece;
a spectroscopy unit for dividing the reflected light received by said light-receiving unit;
a spectral data generator for generating spectral data from the divided light; and

a processor for calculating a characteristic value of said surface of said workpiece according to a calculation including a multiplication which multiplies said spectral data by a predetermined weight function.

Claim 44 (New) An apparatus according to claim 43, further comprising:
an input unit for setting said weight function; and
a display unit for monitoring said characteristic value.

Claim 45 (New) An apparatus according to claim 43, further comprising:
a polishing surface;
a top ring for holding said workpiece and pressing said surface of said workpiece against said polishing surface;
a detector for detecting a characteristic point of time variation of said characteristic value;
and
a control unit for stopping a polishing process or changing a polishing condition after elapse of a predetermined time from detection of said characteristic point.

Claim 46 (New) An apparatus according to claim 43, wherein said film comprises a metal film.

Claim 47 (New) An apparatus according to claim 43, wherein said film comprises an oxide film.

Claim 48 (New) An apparatus according to claim 54, wherein said processor multiplies said spectral data by a desired second weight function different from said weight function and integrates the product to generate a second scalar value, and calculates a second characteristic value of said surface of said workpiece using said second scalar value.

Claim 49 (New) A polishing state monitoring apparatus comprising:
a light source for applying light to a surface, being polished, of a workpiece;
a light-receiving unit for receiving reflected light from said surface of said workpiece;
a spectroscopy unit for dividing the reflected light received by said light-receiving unit;
a spectral data generator for generating spectral data from the divided light; and
a processor for calculating a characteristic value of said surface of said workpiece
according to a calculation including a multiplication which multiplies said spectral data by a
predetermined weight function.

Claim 50 (New) A polishing state monitoring apparatus according to claim 49, further
comprising an input unit for setting said weight function and a display unit for monitoring said
characteristic value.

Claim 51 (New) A polishing state monitoring apparatus according to claim 30, wherein said
light-receiving elements accumulate the detected light rays as electrical information.

Claim 52 (New) A method according to claim 36, wherein said calculation includes an
integral which integrates said spectral data multiplied by said weight function to generate a scalar
value.

Claim 53 (New) A method according to claim 36, wherein said weight function has a larger
value for a large change in a wavelength range; and wherein said spectral data after a polishing
end point differ from those before said polishing end point.

Claim 54 (New) An apparatus according to claim 43, wherein said calculation includes an
integral which integrates said spectral data multiplied by said predetermined weight function to
generate a scalar value.

Claim 55 (New) A polishing state monitoring apparatus according to claim 49, wherein said calculation includes an integral which integrates said spectral data multiplied by said predetermined weight function to generate a scalar value.

Claim 56 (New) A polishing apparatus comprising:
a top ring for holding a workpiece;
a rotating polishing table having a polishing surface which is brought in sliding contact with said workpiece;
a light transmission unit provided in said polishing surface;
a light-emitting unit for applying light to a surface, being polished, of said workpiece;
a light-receiving unit for receiving reflected light reflected from said surface of said workpiece and transmitted through said light transmission unit;
at least one light-receiving element for accumulating and releasing information of said reflected light; and
a control unit for controlling said light-receiving element to start releasing information of said reflected light based on a rotation angle from a line which interconnects the center of said polishing table and the center of said workpiece.

Claim 57 (New) A polishing apparatus comprising:
a top ring for holding a workpiece;
a rotating polishing table having a polishing surface which is brought in sliding contact with said workpiece;
a light source for applying light to a surface, being polished, of said workpiece;
a light-receiving unit for receiving reflected light from said surface of said workpiece; and
a control unit for controlling energization of said light source based on a rotation angle from a line which interconnects the center of said polishing table and the center of said workpiece.

Claim 58 (New) A polishing apparatus according to claim 57, further comprising:

a sensor mounted on the outer circumferential edge of said polishing table for detecting a rotation angle of said polishing table.

Claim 59 (New) A polishing state monitoring apparatus according to claim 30, wherein said light source emits light having a wavelength band.

Claim 60 (New) A polishing state monitoring apparatus according to claim 30, wherein said light source comprises a pulsed light source.

Claim 61 (New) A polishing state monitoring apparatus according to claim 30, wherein said light source comprises a continuous light source which is continuously turned on at least while said light-receiving elements are detecting the reflected light from said surface of said workpiece.

Claim 62 (New) A polishing apparatus comprising:

a top ring for holding a workpiece;

a polishing table having a polishing surface which is brought in sliding contact with said workpiece;

a polishing state monitoring apparatus according to claim 30; and

a light transmission unit mounted on said polishing table for transmitting therethrough the light applied from said light-emitting unit of said polishing state monitoring apparatus and the reflected light from said surface of said workpiece.